EK-KLIN-UG-001

KLINIK User's Guide for KL10-Based Systems

digital equipment corporation • marlborough, massachusetts

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PREFACE

This manual describes Digital Equipment Corporation's remote diagnosis facility, the *KL*10 *I*ntegrated *N*etwork for *I*nvestigation and *K*orrection, hereafter referred to as KLINIK.

The manual provides a conceptual and technical description of how KLINIK is to be used by field service as an integral part of the branch-resource-based maintenance philosophy for KL10-based systems.

Reference to other documents is necessary to fully understand the nature and application of the maintenance software tools utilized via a KLINIK link.

SECTION 1
SIMPLIFIED KLINIK DESCRIPTION

1.1 SIMPLIFIED KLINIK DESCRIPTION

The KLINIK remote diagnosis system is based on a computer system whose traditional console control/investigation functions can be manipulated over a telephone line. This remote control capability is available to anyone who can properly interface to a telephone line and who has the knowledge and credentials needed pass through the computer's security system.

The effectiveness of KLINIK depends on the ability of the user and the features/capabilities designed into the computer system's hardware and software.

1.2 UTILIZATION ON KL10-BASED SYSTEMS

All KL10-based systems will have the KLINIK remote diagnosis capability while running standalone diagnostics, TOPS10 or TOPS20 (RSX20F). This capability is provided by a second DL11 (DL11E) in the PDP-11/40 Front End Processor. This DL11E will be connected to a modem (Bell 103A3) that will be provided by the customer at each contract site.

A remote TTY (with acoustic coupler) could use this DL11E to log onto the system. This privilege has to be given by the site operator for security reasons. Both diagnostic and monitor software are prepared to handle this remote TTY. *In most modes,* the second TTY appears, when connected, as a second CTY with all the privileges associated with that device. Essentially, this means that the normal CTY will operate in parallel with the remote TTY. Any commands entered on either TTY will be accepted and the CPU will echo to both TTYs simultaneously. Consequently, everything that is input or output to one will appear on the other.

1.3 USE OF THE REMOTE DIAGNOSIS FEATURE

There are four main ways in which the KLINIK remote diagnosis feature will be utilized. These are:

1. Performance monitoring, statistics gathering, and some preventive maintenance.
2. Initial troubleshooting of a problem by an engineer in the branch.
3. Support-level assistance by a regional or Maynard support engineer.
4. Remote reconfiguration assistance.

1.3.1 Performance Monitoring and Preventive Maintenance

The work in these categories is very similar to that which can now be performed with a remote terminal. However, because the KLINIK feature is a maintenance requirement, DIGITAL is guaranteed access at any time (if the customer permits), regardless of how busy the user's communication equipment is.

Essentially, the procedure is for an engineer in the local branch to log onto a system and examine the SYSERR file. If this shows failures that require further investigation, he then runs any of the normal timeshared diagnostics. (If the SYSERR file shows no problems, the branch engineer may still want to run some diagnostics.) After analyzing the results of these diagnostics, the engineer decides on an appropriate course of action to correct the problem. He can then schedule corrective maintenance time with the customer, select the appropriate set of spares and test equipment from the stockroom, and be prepared to make a short, productive trip to the site.

1.3.2 Initial Troubleshooting

Field service's goal for the KL10 project is a 1:3 man:machine ratio. Therefore, it is likely that a field service engineer will not be on-site when a failure occurs.

When a failure occurs, the customer will call his field service representative in the local branch. This engineer will then log in (even if the KL10 is down) and run diagnostics. When he has isolated the error as closely as possible, he can select the appropriate spares, test equipment, etc., before leaving for the site.

In fact, if there is more than one engineer in the branch, the engineer with the most experience on the option which has failed can take the call.

1.3.3 Support Assistance

A support engineer takes the following attributes with him on the call:

1. A fresh approach to the problem.

2. A higher level of expertise on the failing device.

The use of the remote TTY link allows both these capabilities to be brought to bear on a problems with no delays due to travel time, previous commitments, etc.

Because the lights and switches on the KL10 are simulated by the PDP-11 Front End Procesor, any support engineer on a remote TTY will have the same information that is available on-site. The only limitations for the remote support engineer are that he cannot do basic booting or operate the oscilloscope. Even these restrictions are not as important as in the past. The implementation of special diagnostic features, such as the ability of the PDP-11 Front End Processor to read most major registers and signals, together with the machine architecture – microprogrammed (and therefore clocked) with another computer monitoring its operation – inevitably mean less dependence on signal tracing with an oscilloscope.

Most faults not identified by the diagnostic module callout can be found through a full understanding of the machine operation and the various features available in the diagnostic "console" package. The use of an oscilloscope should only be necessary if the failure is on a bus between modules, if it is a close timing problem, or if it is in the peripheral equipment.

1.3.4 Reconfiguration Assistance

In many cases, malfunctions occur which are such that the system can be reconfigured and continue to operate in a degraded mode. Repair can then be scheduled at a more convenient time. Although it is planned to allow the customer to take the necessary steps to reconfigure and continue timesharing operation by providing him with directional information, there will be times when the field service engineer, via KLINIK, will assist in this process.

1.4 SECURITY ASPECTS OF THE KLINIK REMOTE DIAGNOSIS NETWORK

Computer system security is presently the subject of a great deal of effort and money. In 1972, IBM initiated a long-range program designed to improve data security knowledge and technology. As part of that program, it funded specific investigations at four major sites. These included MIT (DECsystem 10) and TRW Systems, Inc. (DIGITAL customers).

DIGITAL believes that IBM's findings at TRW Systems concerning the IBM RETAIN/370 remote diagnosis system summarize the security problem found by most DIGITAL customers:

> In considering emergency maintenance or preventative maintenance procedure, the following question must be addressed: "Are there certain programs or data files from which the CE or programming systems representative must be restricted?" When the CE uses dedicated hardware or software tools, operations personnel can simply unload and remove all sensitive data. In the case of concurrent maintenance and systems operation, this may not be possible. From a system availability viewpoint, this concurrent maintenance is highly desirable; however, it leaves a potentially huge vulnerability to consider. Under these circumstances, a maintenance procedure must be established for dealing with the computer system's failure and sensitive on-line programs/data. When considering this question, *the use of such tools as IBM's RETAIN/370 must also be considered* because in this case and in conjunction with the local CE, remote specialists may have access (maybe total access) to the central facility.[1]

This quotation describes precisely the problem with KLINIK. The solution to the problem is relatively straightforward and consists of ensuring that:

1. It is a DIGITAL employee who is calling.

2. The DIGITAL employee has a legitimate reason for assuming full console control.

3. Overt operator action is required to allow the special communications line to assume full console control (i.e., a special password has to be input to the PDP-11 by the operator).

and furthermore, if the customer wishes,

4. Overt operator action is required to enable the special communications line (i.e., the operator has to manually answer the data set phone rather than having it in auto-answer).

There are four possible situations in which DIGITAL would want to log onto the customer's system. These situations and the procedures for handling them are:

1. *Customer the placed call; DIGITAL to log in as normal timesharing job.*
   This is a very safe arrangement; the customer should be sure to call only the normal DIGITAL office phone numbers. (DIGITAL will supply each site with a list of phone numbers for the KLINIK centers.)

2. *Customer placed the call; DIGITAL to assume full console control.*
   This is reasonably safe; again, we emphasize that the customer should only call the normal DIGITAL office phone numbers. When he talks to the DIGITAL representative, he will tell him the special password to use (in user mode) to allow him to assume full console control, or will boot and enable the exec-standalone diagnostic control package (KLDCP).

[1] IBM Corporation, *Data Security and Data Processing*, Volume 5, p. 58, 1974.

3. *DIGITAL placed the call; DIGITAL to log in as normal timesharing job.*
This situation is secure because the caller still has to log in with the normal PPN/password dialogue to monitor and is not getting any special privileges. Furthermore, the remote line will be inhibited from logging in if the customer has "NOT REMOTE LOGIN" status set (e.g., if he did not want any remote user while a payroll was being run).

4. *DIGITAL placed the call; DIGITAL to assume full console control.*
This is by far the most insecure and suspect case. A legitimate question that the customer should ask is "Why does DIGITAL want full console control when I haven't asked for help?" It would seem that there is no valid reason for DIGITAL to take this privilege on its own initiative. Consequently, in order to obtain maximum security, the following steps should be taken.

   a. A DIGITAL representative should phone the customer and explain why he needs full console control.

   b. The customer, when DIGITAL has explained its request, should terminate that phone conversation without giving the special password (which would be required in addition to the normal PPN/password dialogue). He should then call DIGITAL back and give the special password. This ensures that the customer calls a DIGITAL office number and that he does not get misled by a call purporting to be from a DIGITAL employee.

1.4.1 Conclusion

In general, we must ensure that the customer is talking to DIGITAL, especially when full console control is to be given. To achieve this, the customer must only call official DIGITAL office numbers.

If at any time the customer is requested to use a non-standard DIGITAL number (e.g., a software specialist using a portable terminal in a local motel room), then he should verify the number by calling a DIGITAL representative at a normal number or he should personally know the location of the phone (i.e., the software specialist has been on-site and personally given the customer his temporary number).

1.4.2 Future Considerations

In the future, DIGITAL may wish to have the ability to call all sites automatically by an auto-call unit on a system in Marlboro, Massachusetts. This would allow automatic collection of performance statistics.

SECTION 2
TECHNICAL DESCRIPTION

The following descriptions are intended to provide a fundamental understanding of KLINIK – *KL*10 *I*ntegrated *N*etwork for *I*nvestigation and *K*orrection – and how it works.

2.1 HARDWARE/SOFTWARE/USER FUNCTIONAL ORGANIZATION

Figure 2-1 illustrates the KLINIK hardware/software/user functional organization that exists in all KL10-based systems employing the KLINIK facility.

The left-hand side of the figure depicts a KL10-based system and the hardware and software systems which reside on-site and establish the KLINIK link.

The right-hand side of the figure depicts the user community in order of potential usage, beginning at the top with the branch field service offices. Any *one* of these users may employ the KLINIK facility.

2.2 SITE HARDWARE CHARACTERISTICS

Figure 2-2 illustrates the KLINIK DL11E to Bell 103A3 interconnection, which is required during the installation of the KLINIK facility on a KL10-based system.

The left-hand side of the figure illustrates the PDP-11/40 to DL11E to BC05C connection and the right-hand side illustrates the Bell system to Bell 103A3 to BC05C connection.

The signal and pin connections are for reference.

All indicated requirements for DL11E and Bell 103A3 must be met before communication can be established via KLINIK.

2.3 KLINIK USER EQUIPMENT

Figure 2-3 illustrates the KLINIK user equipment which is typically required to establish single-user communication with the KLINIK facility.

Any 300 baud asynchronous terminal interface to the Bell phone system will work. The diagram portrays the simplest method.

2.4 BRANCH KLINIK CENTER FUNCTIONS

Figure 2-4 illustrates the branch KLINIK center functions that must be employed to achieve efficiency in overall maintenance of the KL10-based systems.

It basically depicts a KL10-based system communicating via the KLINIK link to the branch field office. Inside the office are listed the functions which take place in the branch, based on data obtained from the KL10 system via the KLINIK link.

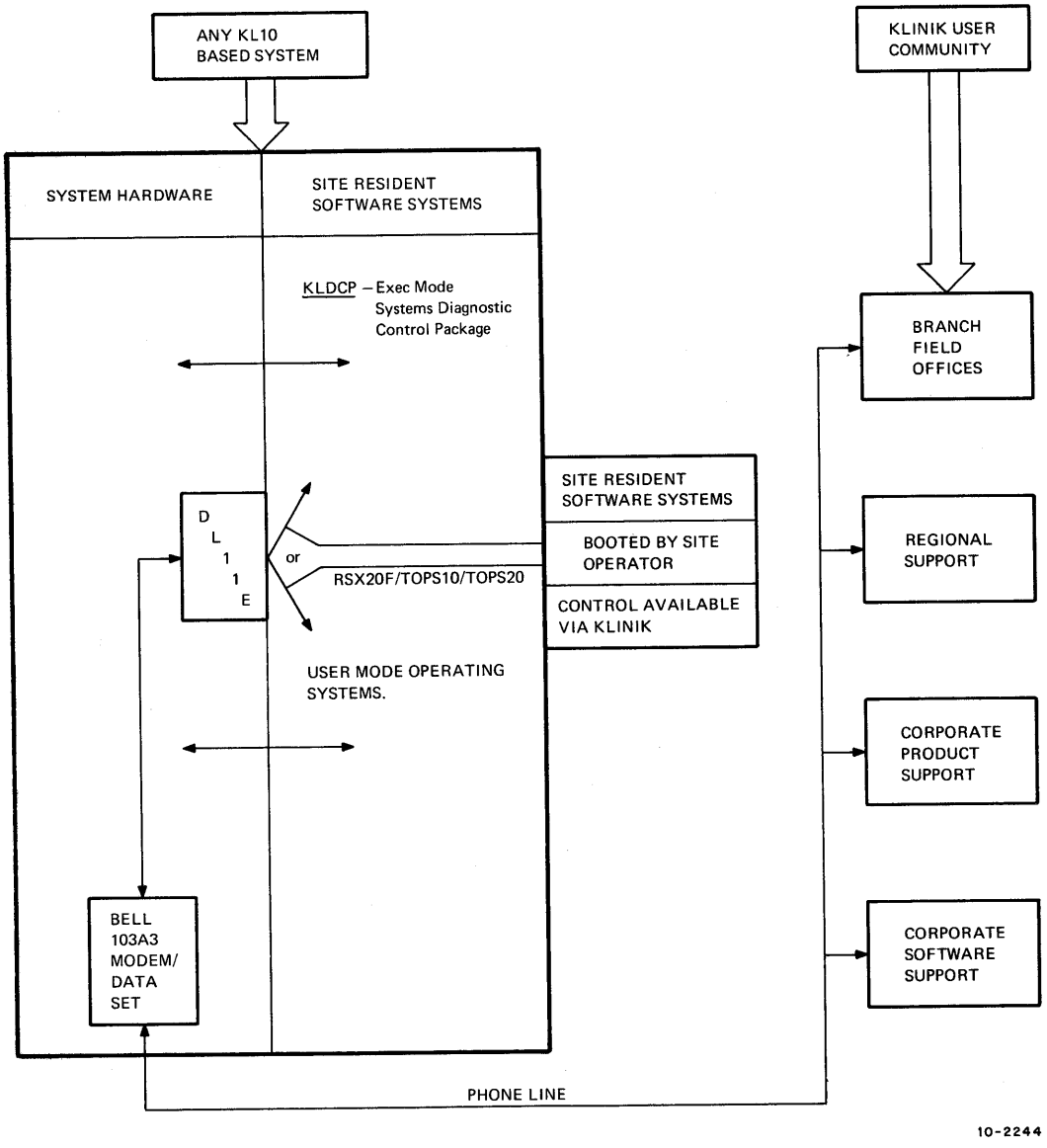

Figure 2-1 KLINIK Hardware/Software/User Functional Organization

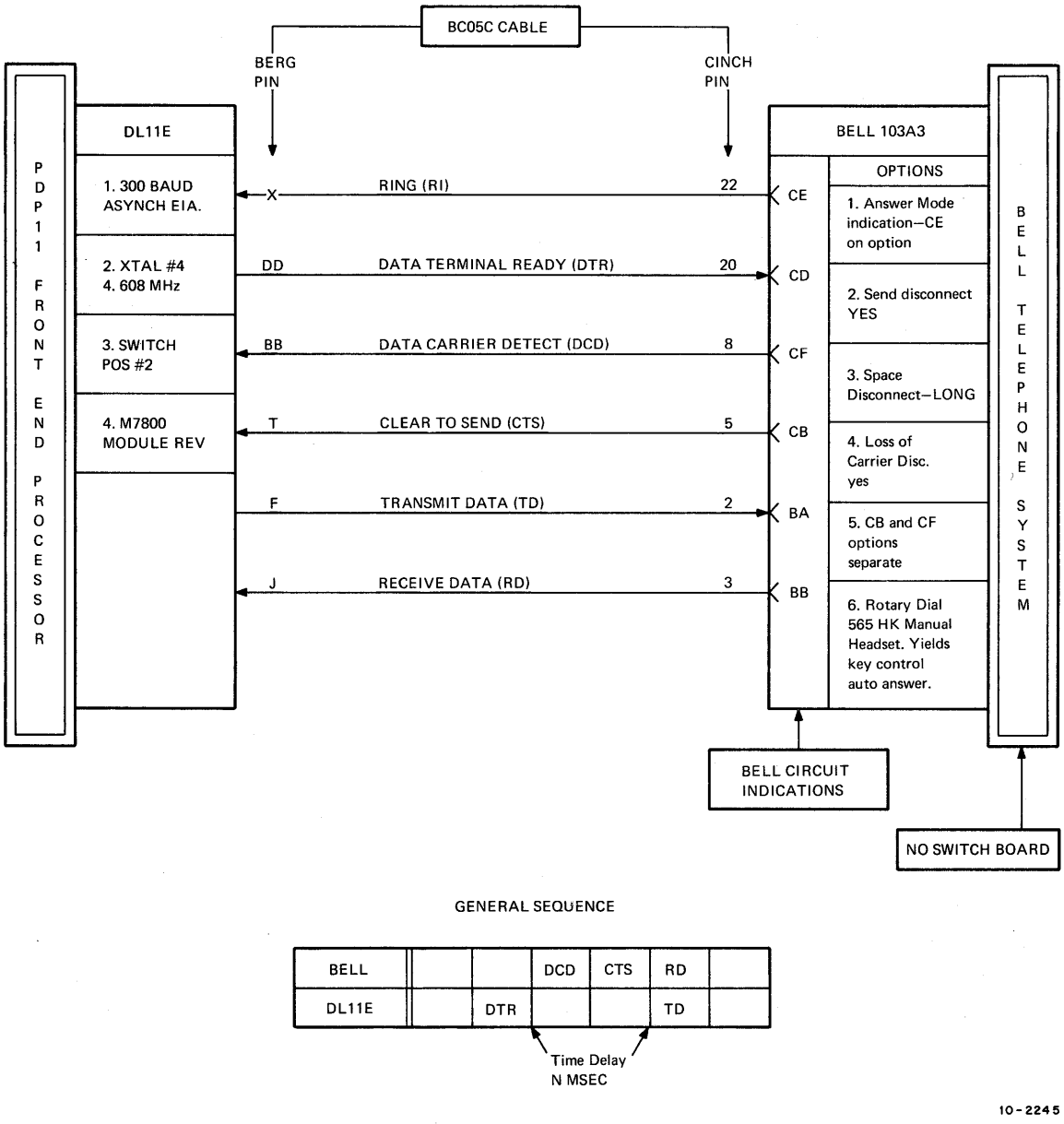

Figure 2-2 KLINIK DL11E to Bell 103A3 Interconnection

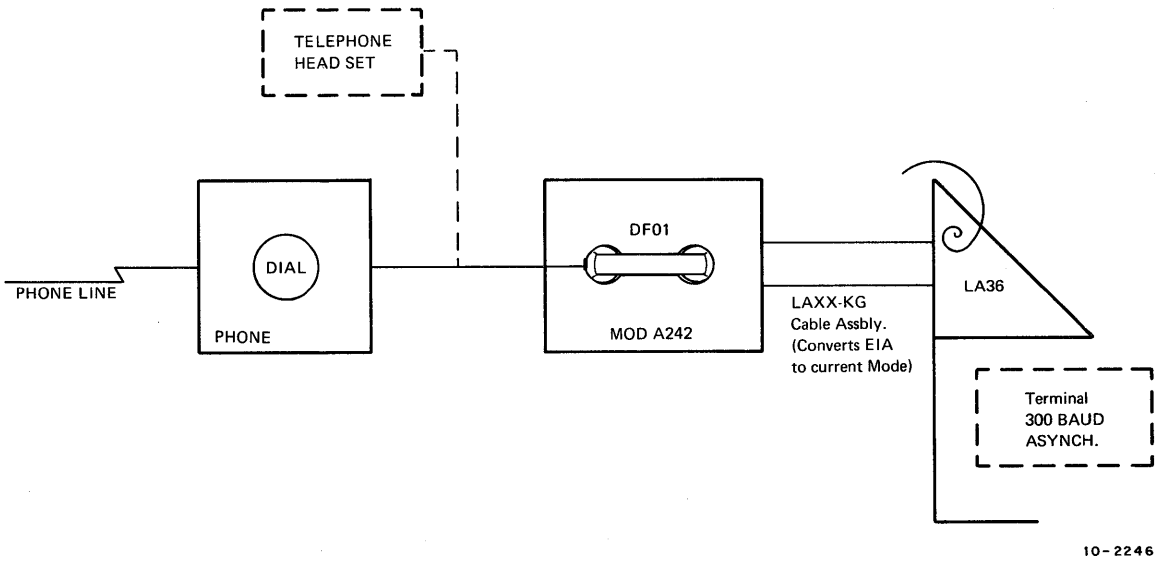

Figure 2-3 KLINIK User Equipment

The ultimate outcome of a malfunction is depicted by indicating the repair resources being dispatched from the branch to the KL10-based system as the end result of "action."

The following is a breakdown of the KLINIK functions:

1. *Auto Diagnosis Analysis* – The KL10 operating systems are capable of diagnosing themselves through internal error detection and reporting which is analyzed via SYSERR and the ability to run user mode diagnostics periodically via batch files and analyzing the results.

   This function is normally invoked by the branch, periodically, as a preventive maintenance function.

2. *Call-Invoked Diagnosis* – Customer-placed calls usually require the branch to invoke some form of diagnostic execution.

   Based on the nature of the apparent malfunction, the field service engineer might run user mode diagnostics (including SYSERR) with the system still up, or he might need to run executive mode diagnostics if the system is non-operational or if he cannot diagnose in user mode.

3. *Diagnosis Result Analysis* – The results of any diagnosis must be analyzed to determine of what action is best for a given situation.

   In some cases, the malfunction cannot be reproduced and/or was caused by elements outside of a hardware malfunction. In these cases, the repair mode must be determined and the possibilities of reconfiguring the system such that it can be operational in a degraded mode must be investigated.

4. *Action* – All discovered malfunctions require action in some form. The system may be reconfigured to bypass a malfunctioning component in some cases and repair is scheduled immediately in user mode or deferred until later (probably in exec mode).

   Eventually the malfunction repair is initiated. Based on the diagnosis analysis, the most qualified available manpower is selected, the needed parts and test equipment are determined, and the repair call is initiated.

2.5 BRANCH LOGISTICS OPERATION

Figure 2-5 illustrates the branch logistics operation.

The branch is initially sent a predetermined set of replacement parts for every option that it must service. With the exception of a few site parts (power and PM), the initial kits will remain in the branch.

The figure should be viewed from the center, which depicts the branch office. The KLINIK remote diagnosis center on the left is shown connected to three KL10 sites. This facility is also shown diagnosing and dispatching three typical repair calls:

1. Diagnosed to RP04 unit – Take kit on call.

2. Diagnosed KL10 CPU to module – Take module on call.

3. Diagnosed to PDP-11/40 basic malfunction – Take basic PDP-11/40 kits on call.

The bottom portion of the figure depicts the basic logistics flow for bad parts (modules).

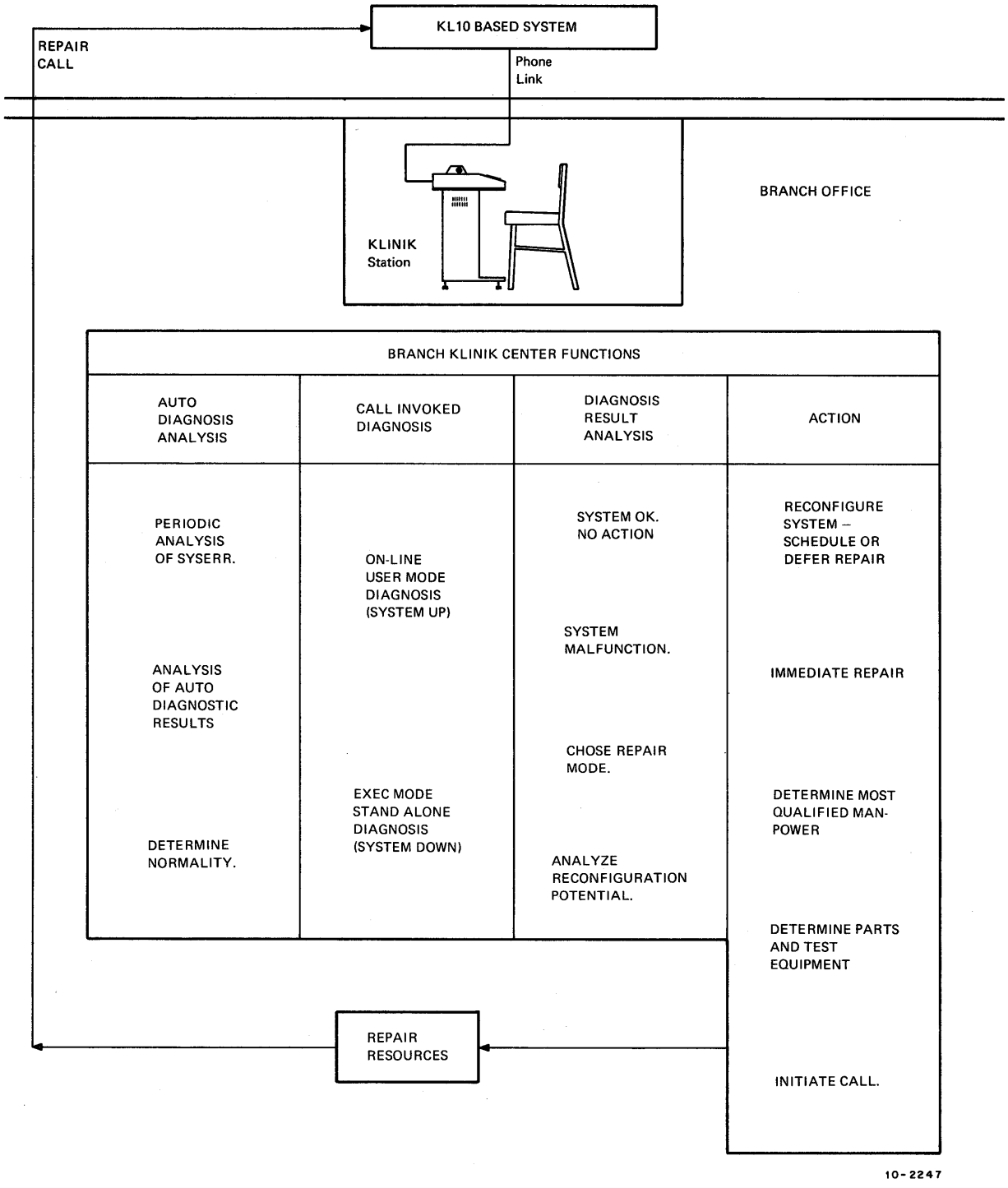

Figure 2-4 Branch KLINIK Center Functions

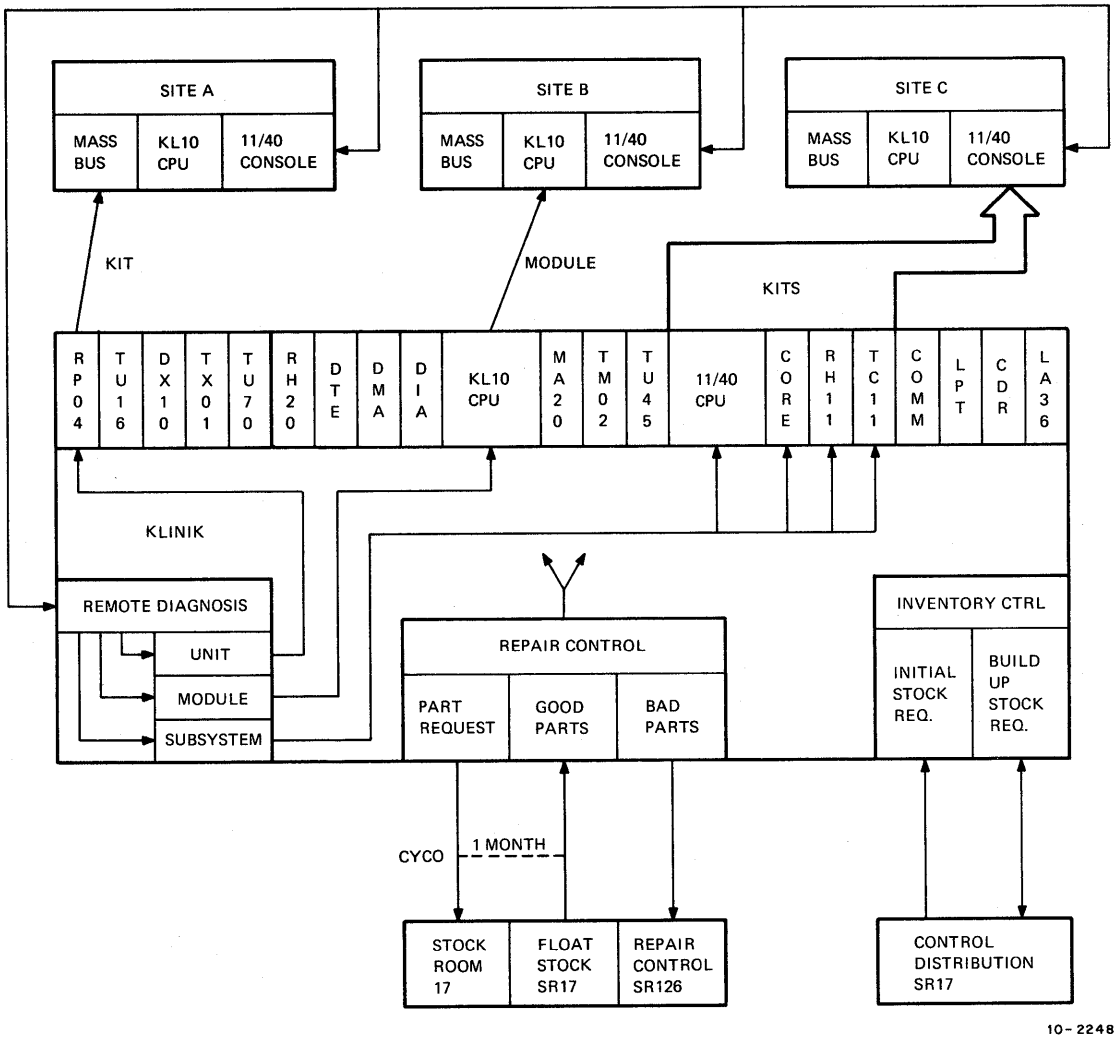

Figure 2-5 Branch Logistics Operation

2.6 KLINIK - EXEC MODE OPERATIONAL DETAILS

When the KL10 is in exec or standalone mode, the diagnostic program KLDCP is used to execute the diagnostics, establish the diagnostic console, and establish the KLINIK communication link.

The procedure for establishing the KLINIK link is listed below. This procedure can vary, depending on whether the KL10 installation has a regular telephone in the computer room for voice communication or only has the Bell 103A3 for voice communication. In either case, the Bell 103A3 must be in "AUTO" and ringing when the operator types the KLINIK command.

1. Dial the computer operator on a regular phone or the Bell 103A3. (It must be in "TALK.")

2. Instruct the operator to bring down the system and remove all volatile media (tapes, disks).

3. Have the operator mount the KLAD pack on drive 0 and/or any other required diagnostic media.

4. Have the operator boot KLDCP via the manual boot switches (disk boot if using KLAD pack; floppy or DECtape boot if not using KLAD pack).

5. If the Bell 103A3 is utilized for voice communication, it must be hung up by the operator and placed in "AUTO."

6. Dial the KLINIK Bell 103A3 number. When it rings, the remote handset should be placed in the DF01 acoustic coupler. The operator must then type "KLINIK" to KLDCP while the phone is ringing.

7. KLDCP will respond with "KLINIK ENABLED" if the link has been successfully established.

   If "KLINIK ENABLED" is not returned, repeat the operation with an alternate KLDCP load device. A failure after this procedure will indicate faulty KLINIK communication hardware if the local CTY gets a message, "NO CLEAR TO SEND - KLINIK CLEARED."

   No response at either terminal suggests a basic front end processor malfunction; KLDCP will not boot.

8. Commands may now be executed by KLDCP via the KLINIK link. Both the remote KLINIK terminal and the local CTY are in parallel, echoing whatever is typed by either one.

9. Messages may be transmitted in either direction by preceding the message with a semicolon (;).

10. The retyping of "KLINIK" by either TTY will clear the KLINIK link.

Reader's Comments

KLINIK USER'S GUIDE FOR
KL10-BASED SYSTEMS
EK-KLIN-UG-001

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